PC PLUS ★ WARE™ NEWS
A PUBLICATION OF STSC, INC.

Fall 1986

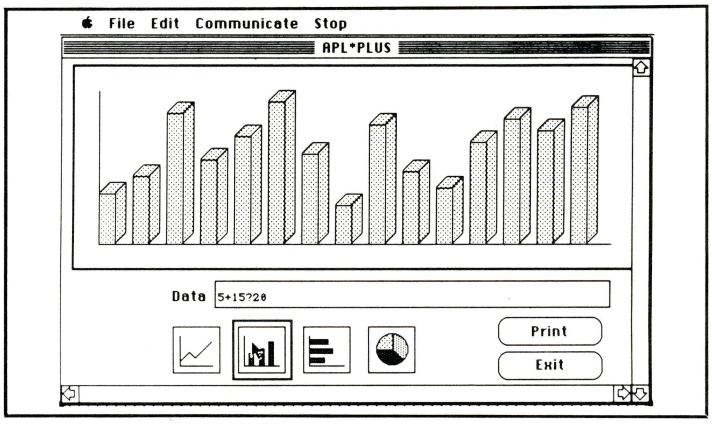
APL★PLUS SYSTEM NOW AVAILABLE FOR MACINTOSH COMPUTERS

STSC is pleased to announce the release of the APL★PLUS System for Macintosh computers. This latest APL★PLUS System product gives you the best of both worlds—the raw power and productivity of the APL language combined with the easy-to-use environment of the Apple Macintosh computer.

APL★PLUS for the Macintosh is a full APL★PLUS System that is compatible with other APL★PLUS System implementations, so you can readily convert existing applications to the Macintosh. The workspace size is limited only by the available memory, and your variables can grow nearly as large as your workspaces. In addition, a built-in terminal emulator allows your Macintosh to be used as an APL terminal to a mainframe computer.

APL★PLUS Systems execute roughly the same speed on a Macintosh as they do on a PC. Macintoshes equipped with optional 68020 CPUs and 68881 coprocessors provide performance comparable to the APL★PLUS System on IBM ATs.

(continued on page 5)



The PLOTDEMO workspace (shown above) integrates superb graphics, mouse interaction, and powerful APL expressions to produce quality business graphic illustrations.

STATGRAPHICS' FEATURES OFFER UNIQUE REGRESSION ANALYSIS

By Ruth Stapko
Statistical Consultant

STATGRAPHICS has two features that make it ideal for regression analysis. The readily available graphics and the ability to transform variables as they are entered allow you to quickly diagnose and correct models that are inadequate because they violate basic assumptions.

Let's look at an example taken from *Regression Analysis by Example,* by Chatterjee and Price (Wiley, 1977). We'll see how to deal with unequal error variance, called "heteroscedasticity" by those who can say it.

In our example, variable Y is a set of observed counts of supervisors in 27 manufacturing plants, and X is the set of corresponding counts of workers. We wish to fit a model for Y as a linear function of X. Data was entered in STATGRAPHICS using the full-screen data editor.

Using the multiple regression procedure, we entered Y for the dependent variable and X for the independent variable. Model fitting results gave us this regression equation:

$$Y_t = (.105 * X_t) + 14.45 + \varepsilon_t$$

STATGRAPHICS provides several statistics including the standard error of each coefficient. In this example, the standard error of the slope is .011. The ε_t in the above expression represents the error term. Errors are assumed to be independent with a zero mean and a constant variance.

However, a plot of the residuals versus the observed values of X, which is four keystrokes away in STATGRAPHICS, shows that the variance of the error term increases as X increases, indicated by the "fanning out" pattern of the residuals (Figure 1). This condition is given the frightening name heteroscedasticity, and may indicate a poor model.

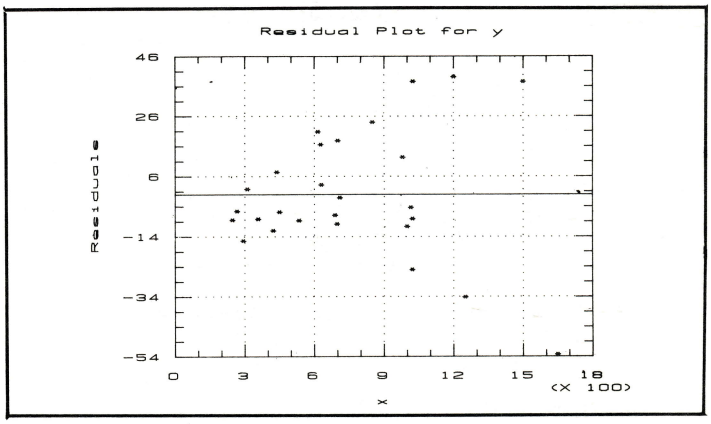


Figure 1
Heteroscedasticity Apparent

(continued on page 2)

Regression Analysis

(continued from page 1)

Chatterjee and Price explain that if we can assume that the error variance is proportional to the observed value of X, we can make the following transformations to achieve constant error variance:

Dependent Variable: Y/X
Independent Variable: 1/X

These transformations can be entered on the input panel as shown above, eliminating the need to create any new variables. STATGRAPHICS gives us the least squares estimate:

$$(Y/X)_i = (3.8 * 1/X_i) + .121 + \varepsilon_i$$

and the residual plot (Figure 2) shows that the fanning out pattern is gone. The standard error of the slope is also reduced to .009.

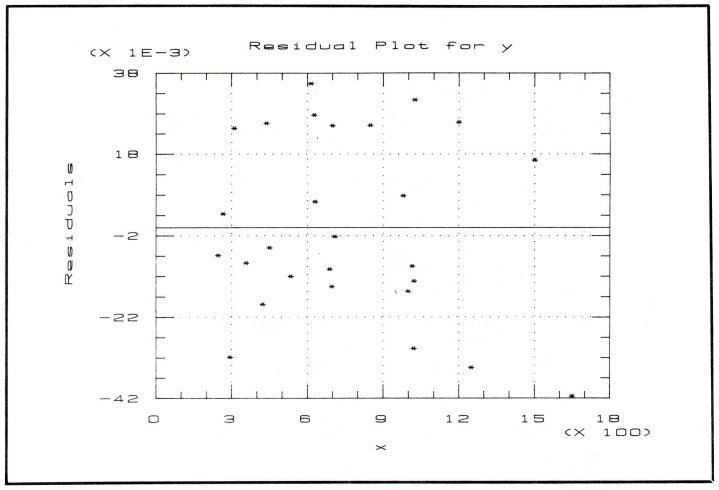


Figure 2
Heteroscedasticity Removed

Chatterjee and Price go on to show that the above model can be expressed as

$$Y_i = (.121 * X_i) + 3.8 + \varepsilon_i$$

in terms of the untransformed data.

Both regression lines are plotted with the untransformed data in Figure 3. This plot was created using the *NOCLEAR* command, which allows consecutive plots to be drawn on the same pair of axis.

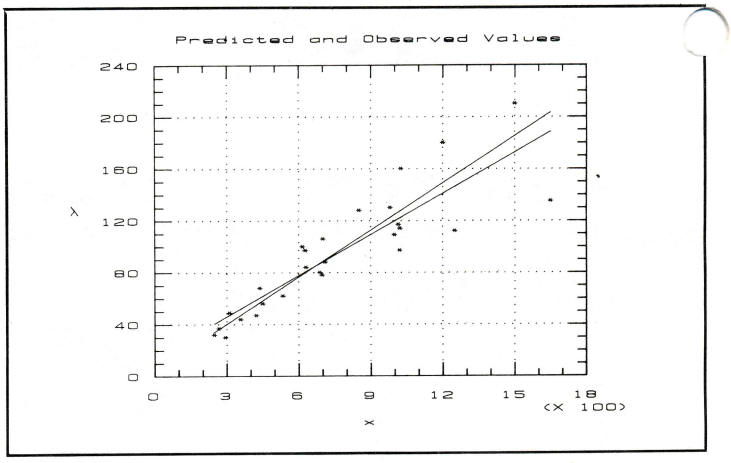


Figure 3
Plot of Fitted Models

If we prefer not to transform our original variables, Chatterjee and Price show that use of a weight vector equal to the reciprocal of X-squared gives exactly the same model. Thus, a carefully designed weighted regression model can also be used to overcome heteroscedasticity. With STATGRAPHICS, we can enter the weighting vector directly on the input panel. Again, we can simply enter 1/X∧2 without having to create any new variables or data sets.

Regression analysis is both an art and a science, and the combination of graphics and statistics available in STATGRAPHICS gives you a powerful tool for examining and comparing alternative model. The preceding example illustrates the type of capabilities available throughout STATGRAPHICS. In future articles we'll explore other procedures including time series analysis, analysis of variance, multivariate methods, and the many and varied plotting procedures.

PC HELP LINE NEWS

New Release for APL★PLUS System On PC AT/Xenix

Release 3.0 of the APL★PLUS System is now available for users running under Xenix on the IBM PC AT. This new version contains fixes for some edge conditions and bugs that have been found. New systems have already been mailed to all current registered users. If you have not received the upgrade, call the Help Line (301-984-5489) with your serial number and the version of your APL★PLUS System and we will send an upgraded system to you.

Update Your APL and STATGRAPHICS to Continue Full Help Line Support

In August, we began shipping new releases of the APL★PLUS System and STATGRAPHICS. In addition to new enhancements and features, customers who update their systems are entitled to ongoing technical support without additional charge.

To continue to receive full support, be sure to update your systems by **March 1, 1987.** After that date, the Help Line will no longer provide bug fixes, patches, or other utilities for users with outdated versions.

Updates for the APL★PLUS System, from Release 5.0 to Release 6.0, and STATGRAPHICS 2.0 cost $125 and $195, respectively. To upgrade your system, call toll-free 800-592-0050.

PC PLUS★WARE NEWS

PC PLUS★WARE NEWS is published four times a year by STSC, Inc., and is distributed free of charge to registered licensees of the APL★PLUS System for the PC and STATGRAPHICS.

Comments regarding the newsletter should be sent to PC PLUS★WARE News, Editor, STSC, Inc., 2115 East Jefferson Street, Rockville, Maryland 20852.

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All prices quoted are U.S. Suggested Retail Price. International prices may vary.

y Ralph Fox
Product Development Manager

Eigenvalues for Everyone

EIGENVAL, a new workspace distributed with Release 6.0 of the APL★PLUS System for the PC, contains utility functions for finding eigenvalues and eigenvectors of a real, square matrix. Although this workspace will appeal mostly to those interested in engineering, linear algebra, and mathematical physics, this article will describe a simple application of eigenvalues to everyday decision-making. Thanks are due to Professor Thomas L. Saaty of the University of Pittsburgh for bringing this technique to my attention.

For a square matrix *MAT,* a scalar *S* is called an eigenvalue for *MAT* if there is a vector *VEC,* not all zero, such that *MAT +.× VEC* is equal to *S × VEC. VEC* is called an eigenvector for *S.* Geometrically, this means that the linear transformation represented by *MAT* simply performs a stretching or shrinking when applied to *VEC.* An N-by-N matrix can have up to N distinct eigenvalues. For example, to find the various eigenvalues and eigenvectors for the matrix *MAT*:

```
1 ¯3  3
3 ¯5  3
6 ¯6  4
```

start with the *EIG* function in the *EIGENVAL* workspace:

```
      □←E←1 EIG MAT
4          ¯2          ¯2
0.40825     0.64433     0.70518
0.40825    ¯0.11214     0.70902
0.8165     ¯0.75648     3.847E ¯3
```

Because all the eigenvalues of *MAT* are real, the result *E* contains the eigenvalues (4 and ¯2) in the first row, and unit-length eigenvectors stored vertically below the corresponding eigenvalues. (If some eigenvalues are complex numbers, then the result will contain eigenvalues only in a two-row matrix of real and imaginary parts.) Let's check our results:

```
      V1←1↓E[;1] ◇ (MAT+.×V1)≡4×V1
1     V2←1↓E[;2] ◇ (MAT+.×V2)≡¯2×V2
1
```

and likewise, *V3←1↓E[;3]* will be a second independent eigenvector for the eigenvalue ¯2.

Preference Matrices

Suppose we have two choices, A and B, and A is twice as preferable, or twice as likely, as B. We can express this preference in the table:

	A	B
A	1	2
B	.5	1

Corresponding to the 2 in the [A;B] position, place the reciprocal .5 in the [B;A] position; the interpretation is that B is one-half as preferable as A. Notice what happens when we search for the eigenvalues of the preference matrix:

```
      □←E←1 EIG 2 2⍴1 2 .5 1
2          0
0.89443    0.89443
0.44721   ¯0.44721
```

We get an eigenvalue (2) equal to the number of choices and the elements of its eigenvector embody the 2-to-1 preference ratio of A to B. Since a multiple of an eigenvector is also an eigenvector, let's call the eigenvector whose elements sum to 1 an eigenweight:

```
      EV←1↓E[;1]◇ □←EW←EV÷ +/EV
0.66667    0.33333
```

Note that the eigenweight represents preference weights or probabilities associated with each choice.

When trying to extend this simple two-by-two analysis to a greater number of choices, preference inconsistencies quickly arise. Consider the case of three choices A, B, and C:

	CON			*SIC*			*VIC*		
	A	B	C	A	B	C	A	B	C
A	1	2	6	1	2	4	1	2	.167
B	.5	1	3	.5	1	3	.5	1	3
C	.167	.333	1	.25	.333	1	6	.333	1

The matrix *CON* represents complete consistency: A is twice preferred to B, B is three times preferred to C, and A is six times preferred to C. *SIC* represents a slight inconsistency: it is the same as *CON*, except that A is only four times preferred to C. *VIC* represents a very inconsistent situation: A is twice preferred to B and B is three times preferred to C, but C is six times preferred to A.

Let's run the eigenvalue analysis:

```
      □←E←1 EIG CON
0          3          0
0.94821    0.88465    0.95777
0.21826    0.44233    0.18398
¯0.23079   0.14744   ¯0.22096
```

```
      EV←1↓E[;2] ◇ □←EW←EV÷ +/EV
0.6  0.3  0.1
```

(continued on page 4)

UPDATE YOUR APL★PLUS SYSTEM FOR THE PC NOW BEFORE PRICE INCREASES

If you haven't updated your APL★PLUS System for the PC from Release 5.0 to Release 6.0 yet, be sure to order your update today. The price for the update increases to $150 after January 1, 1987.

ORDER TODAY!
Call (800) 592-0050

Treasure Chest

(continued from page 3)

We see that the consistent case produces an eigenvalue (3) equal to the number of choices and that the corresponding eigenweight contains exact preference ratios.

In the slightly inconsistent case, there is a real eigenvalue (3.0183) close to the number of choices, and a pair of complex eigenvalues:

```
      □←E←1 EIG SIC
3.0183      ¯9.1474E ¯3     ¯9.1474E¯3
0           0.23481         ¯0.23481
```

Now select the real eigenvalue 3.0183 and use the *EIGVEC* function to calculate its eigenvector and eigenweight:

```
EV←SIC EIGVEC E[1;1] ◇ □←EW←EV÷+/EV
0.55842  0.31962  0.12196
```

The resulting eigenweight preference ratios differ from that of *CON* in a minor, reasonable way.

Finally, let's check the very inconsistent case:

```
      □←E←1 EIG VIC
4.6048      ¯0.80239        ¯0.80239
0           2.5973          ¯2.5973
```

```
EV←VIC EIGVEC E[1:1]◇ □←EW←EV÷+/EV
0.22381  0.3695  0.40669
```

Note that this case produced a real eigenvalue (4.6048) much larger than the slightly inconsistent case. The eigenweight values are still justifiable, however, Option C has the highest rating (.40669) because it has a preference factor (6) larger than either A or B has. Thus, a valid case can be made for using the eigenweight vector corresponding to the eigenvalue greater than or equal to the number of options as a rational method of handling inconsistent preferences and ratings.

How to Select the Best Team, Vacation, Husband, Etc.

Often an inconsistent circle of preferences or dominances is found in the sporting world. Consider these round-robin tournament results:

Asps 30, Boas 14;	Cats 16, Dogs 10;	Emus idle
Cats 41, Asps 13;	Boas 21,, Emus 7;	Dogs idle
Asps 10, Emus 3;	Dogs 20, Boas 13;	Cats idle
Dogs 17, Asps 12;	Emus 35, Cats 16;	Boas idle
Boas 27, Cats 6;	Dogs 21, Emus 20;	Asps idle

How should the teams be ranked? The eigenvalue approach is to assign a preference matrix after some translation of actual game points into preference factors. These factors should be interpreted as:

1 — equivalent or incomparable
3 — slightly favored
5 — strongly favored
7 — demonstrated preference
9 — absolute preference

The resulting matrix might look like this:

	Asps	Boas	Cats	Dogs	Emus
Asps	1	5	.111	.333	3
Boas	.2	1	7	.333	5
Cats	9	.143	1	3	.143
Dogs	3	3	.333	1	1
Emus	.333	.2	7	1	1

The rest of the analysis is as before. Take the opportunity to work out the eigenweight vector and compare it to the teams' won-lost records. The final team rankings will surprise you!

APL★PLUS FOR THE SEQUENT BALANCE COMPUTER

STSC recently completed porting its APL★PLUS System to the Sequent Balance Computer under UNIX System V.

The Sequent Balance features a unique multi-CPU, parallel processing architecture for efficient handling of multiple users. Sequent will outfit the computer with a specific number of CPU chips, based on the number of users you plan to support. According to the manufacturers, adding essentially one CPU chip for each user ensures that each user will get all the processing power he needs and will not be adversely affected by heavy load on the computer.

In general, the features of the APL★PLUS System under UNIX are a mixture of the capabilities of STSC's products for the microcomputer and mainframe environments, taking the best from both worlds as well as some powerful new features. Included are:

- A full-screen ring editor, similar to)EDIT in the PC System, except that it allows you to edit many objects at a time. Also, the APL session itself may be edited, meaning that you can easily move text or APL statements from the session into a function or variable. Further, the editor is independent of the active workspace. This means you can move from one workspace to another and carry the objects in the "edit ring" with you.
- Access to non-APL programs and facilities using native files. These include features that allow you to make use of UNIX multi-tasking capabilities by creating a "forked process," or independent task. Thus you can create tasks to drive a printer or query a database while you continue to work in immediate execution mode or in the editor.
- Size limits of workspaces and objects controlled only by the amount of memory your system contains. In fact, the system will allow you to use "virtual memory," giving you workspaces larger than the amount of real memory you have installed in your computer.
- Nested arrays which extend the flexibility of APL, allowing you to freely mix character and numeric data, and permitting non-rectangular data structures. A set of new APL primitive functions and operators is provided to manage these structures.
- A true shared file facility so you can create multi-user applications, allowing several users to update the same files with no risk of data loss. A "file hold" mechanism is provided to ensure data integrity.
- "Precompilation" of user-defined functions. The system performs a lexical analysis of each user-defined function the first time it is executed, and generates a "pseudocode" from it. This pseudocode runs much faster than ordinary interpreted APL; speedups of 25% are not uncommon. This approach helps eliminate much of the overhead associated with interpreted APL, particularly in processing loops.

The APL★PLUS System for the UNIX environment runs on over a dozen computers as well as the Sequent Balance. Step up to the world's most advanced APL development system, running on today's most advanced computers. Call your local dealer or STSC for more details.

(continued from page 1)

Among the ease-of-use features of the APL★PLUS System for the Macintosh are

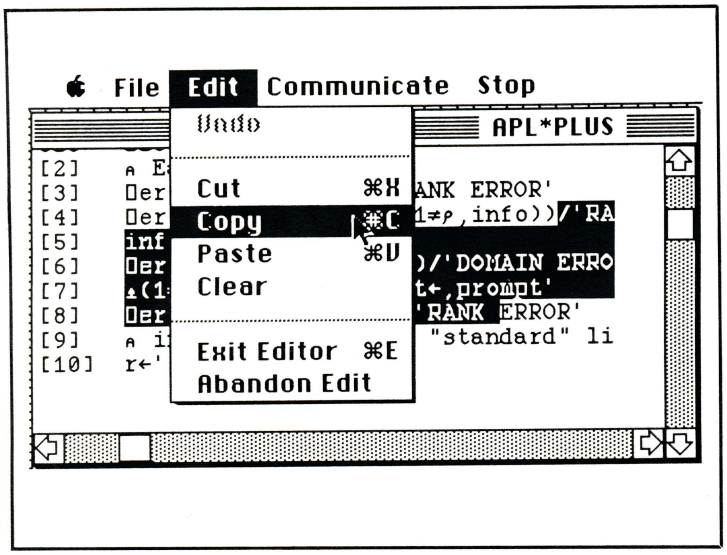
- pull-down menus for commonly used system commands and editing
- workspaces that can be "double-clicked" from the Macintosh and run automatically
- dialog boxes for locating files and workspaces
- a pull-down keyboard map
- direct access to the Macintosh desk accessories
- import/export capabilities with other programs, using the Macintosh "Clipboard"
- a standard cut-and-paste full-screen editor with horizontal and vertical scrolling which enables you to edit APL functions and general text
- editing commands that can be entered from the keyboard or from the EDIT pull-down menu.

In addition, with APL★PLUS for the Macintosh, no hardware modifications are required to display and print the APL characters.

Another exciting aspect of the APL★PLUS System for the Macintosh is the ability to run many APL functions that use the QuickDraw graphics system based on built-in ROM routines. Line and shape drawing, shape manipulation, and text drawing are also built into the product. Any high-resolution text or graphic images that you create on your Macintosh can be printed on either the Imagewriter or LaserWriter printers.

The package includes two diskettes, a 211-page user's guide, and a quick reference booklet. In addition to the APL interpreter, the software includes an extensive collection of utility and demonstration workspaces.

Suggested U.S. retail price of the package is $395 plus shipping and handling and state tax where applicable. International prices may vary.



Edit menu shown above illustrates the Mac-like editing features of the APL★PLUS System for the Macintosh.

Q & A

STATGRAPHICS

Q. I'm using STATGRAPHICS, and I'm trying to display the contents of a variable. The system displays the message "File Not Found," but I know that the file is there because it was displayed in the Data Directory. Why is this happening and how can I correct it?

A. The system is unable to locate the file because you do not have enough file handles to enable STATGRAPHICS to access the file that contains the desired variable. To correct this, you must have a *CONFIG.SYS* file with a FILES setting of at least 20 (Files=20). This file must reside on your boot disk. Or, if you boot off a hard disk, *CONFIG.SYS* must be in the root directory of your hard disk.

You must reboot your computer before the news *CONFIG.SYS* file is effective.

Q. When specifying logon parameters for STATGRAPHICS Version 2.0, why do I say that my primary data drive is D when I know that it is on my C hard disk?

A. STATGRAPHICS uses a set of pseudo-drive letters to distinguish different paths on the hard disk. If you look at the input panel for the Define Directory Drives procedure (DRIVES command), you will see that each line begins with a letter followed by a highlighted area. The letter on each line gives the name of the pseudo-drive, the highlighted area shows the currently defined path. An existing path can be changed by typing over the current entry. A path can be added by typing it on the next empty highlighted line. After a pseudo-drive's path definition has been changed, you must exit STATGRAPHICS and reinitialize to put the new paths into effect.

APL★PLUS System

Q. I have a Hercules monochrome graphics card. How can I display APL characters on the screen without installing the ROM?

A. While in DOS, execute HGC FULL (this software is provided by Hercules). Then, run the program HSOFT CHR, which is provided with Release 6.0 of the APL★PLUS System for the PC. Enter APL by typing

```
apl e=1024
```

The APL characters will then be generated graphically.

Q. How can I set the mode under Program Control without using ⎕ *CMD?*

A. Here is a program submitted by one of STSC's dealers to solve this problem. For example:

```
MODE 1 1200
```

is equivalent to

```
⎕ CMD 'MODE COM1:1200'
```

INDEPENDENT SOFTWARE CATALOG

This catalog provides a summary listing of application and utility software available from third-party developers. These products have not been tested by STSC and their inclusion in this catalog does not constitute an endorsement or recommendation by STSC.

APL★DBMS

File creation and retrieval system. For IBM PC and compatibles. *Price: $40. Contact: INFO★PLUS, P.O. Box 91030, Johannesburg, South Africa 2006. (11) 726-8572.*

APL★WORD

Text editor and processor. Text processing performed with dot commands based on IBM's DCF. Handles APL text. For IBM PC and compatibles. *Price: $50. Contact: INFO★PLUS, P.O. Box 91030, Johannesburg, South Africa 2006. (11) 726-8572.*

APL Function File

Provides convenient storage and retrieval of unlocked APL functions in an APL★PLUS PC environment. For IBM PC and compatibles. *Price: $30. Contact: Donald Latour, 172 DuBois Avenue, Sea Cliff, NY 11579. (516) 671-6712.*

Bible Tools

Includes 29 Main Menu options for searching, printing bible verses, interweaving text notes, cycling form letters, preparing forms, color slides, overheads, address file maintenance, labels, typing letters, documents, and tables. For IBM PC, XT, AT and compatibles. *Price: $250. Contact: Symbiotics, 431 Mishler Road, Mogadore, OH 44260. (216) 699-4978.*

CEO★MODEL

A powerful financial planner. Different than a spreadsheet, CEO★MODEL is a finished model used for forecasting, budgeting, project analysis, corporate consolidations, and any other financial planning activity. For IBM PC and compatibles. *Price: $885. Contact: CEO Software Limited. 421 Eglinton Avenue West, Toronto, Ontario, Canada M4V 1Y1. (416) 484-0004.*

Double ROM

A small business-card-size board that has sockets for both the ASCII ROM and the STSC APL ROM. It plugs directly into the character-generator ROM socket of the video display adapter, and allows software switching between both character sets. Price: $49.95. Specify video adapter used. Contact: Denis Samson, ACCES INFORMATIQUE, 940 Maurese, Quebec, Canada G15 2X1. (418) 688-9645.

Lot Control for Inventory (LC-On Line)

APL-based multiple warehouse inventory lot control system. Provides complete lot history and gains, printed reports and extensions. Menu-driven, runs on STSC's APL★PLUS System for the PC. (APL code unprotected.) For IBM PC, XT and compatibles. *Price: $55, includes shipping and handling. Contact: Custom Computer Modeling, P.O. 434, Gloucester Pt., VA 23062. (804) 642-6864.*

Master Medical Accounting System (MMAS)

A sophisticated medical accounting software system that handles everything from the patient day-sheet to end-of-month patient statements. MMAS has a comprehensive security system to track daily activities. Sold separately or with a complete line of computer systems tailored to the software. For IBM PC, XT and compatibles. *Price: $695. Contact: Holistic Health Group, 1130 Coffee Road, Modesto, CA 95355. (209) 529-7950.*

Note and Deed Discounter

A sophisticated, easy-to-use software package that provides the profit-making edge when buying or selling notes, deeds of trust, and other credit instruments. For IBM PC and compatibles. *Price: $89.95. Contact: G & G Publishing, 1109 So. Plaza Way #312, Flagstaff, AZ 86002. (602) 774-1745.*

OVERLAYS

A machine language program callable by APL functions which packs together any number of APL objects (functions and/or variables) into a single APL variable (an overlay). Unpacking an overlay instantly redefines its constituent objects in the workspace. Overlays are a much more natural way of organizing data on files. Large applications no longer reside in many workspaces, but rather as components on files. Workspaces are no longer needed. For IBM PC and compatibles. *Price: $200. Contact: AMD Informatics, CP 1222, Haute Ville, Quebec, Canada G1R 5A7. (418) 687-9656.*

Pas-Time Billing

Full-screen data input, user defined job phase/codes, and expense categories. Phase/code billing topsets and/or overall job topset. Billings can reflect past due amounts with interest, adjustment of billing total with comment, individual headings and footer comments. *Price: $200. Contact: Patrick Shields, PAS, P.O. Box 2057, Durango, CO 81302. (303) 259-3525.*

PKT BIBLE

Package consists of one program disk with help screens, and three bible text disks containing NT/KJV. The OT/KJV disks are optionally available at $10 each. For IBM PC, PCjr, and compatibles. *Price: $95. Contact: Symbiotics, 431 Mishler Road, Mogadore, OH 44260. (216) 699-4978.*

Route Account Info System

Integrated receivables, order entry, inventory and management accounting system. Unique features include: individual customer price quotes, automatic depletion of product, detailed billing statements, customer product and route profitability, and a wide variety of management reports. For IBM AT and compatibles. *Price: $150. Contact: Fleming Analytic, P.O. Box 202, Oak Forest, IL 60452. (312) 687-5774.*

SAPL-Structured APL

A preprocessor that makes structured control statements available to the APL programmer. Five figures are supported: If-Then-Else, Do-While, Do-Until, Case With Else, and iterative Do-Loop. For IBM PC. *Price: $34.95. Contact: PC-Ware, P.O. Box 3174, Dept. SS, Gaithersburg, MD 20878.*

Screen-Ace Form Master

Screen generator and form manager; multi-language support. Create and maintain forms, tables, text screens and menus. Uses library functions; does not write source code. Works with the APL★PLUS System for the PC, Lattice C, Microsoft C, and MASM. Compatible with DESQview, TopView and MS windows. DOS 2.0 or above, IBM PC or 100% compatible. *Price: $195. Contact: ACE Software Products, Inc., 6934 Petit Avenue, Van Nuys, CA 91406. (818) 989-5329.*

SPC Courier

A complete Statistical Process Control (SPC) package; X-Bar charts, R-charts, P-charts, NP-charts, U-charts, C-charts, histograms, frequency polygons, and pareto diagrams. For Commodore 128 computer. *Price: $59.95. Contact: Dynabyte, P.O. Box 2021, Michigan City, IN 46360. (219) 872-8701.*

UNICOMP

A data base management system requiring no programming. It permits sophisticated retrieval and data manipulation without index creation. Additional features include PERT project management, invoicing, scheduling, et. Price: $150. Contact: Dr. E. Chikuni, Ntech Consultants, P.O. Box FM151, Famona, Bulawayo, Zimbabwe. (30957).

UNITAB

A spreadsheet-like full-screen data entry and validation system with features to ease data entry and editing. The user determines size, location, colors, etc., of the spreadsheet through parameters. For IBM PC and compatibles. *Price: $195. Contact: UNIWARE, 15 Rue Erlanger, 75016 Paris, France.*

Weibul Analyses of Life Data

Provides printout of life data statistics based on a three-parameter Weibul distribution. Includes plotting programs to automatically create a high resolution plot on an HP7475A six-pen plotter or optionally to create a low resolution printer plot. For IBM PC, XT, AT and compatibles. *Price: $75. Contact: Symbiotics, 431 Mishler Road, Mogadore, OH 44260. (216) 699-4978.*

CREATE LARGER WORKSPACES WITH APL★PLUS ON THE PC

Many users of the APL★PLUS System for the PC have asked about the use of expanded memory to create larger workspaces. With Release 6.0, it is now possible to use extended memory. If you are willing to purchase some additional memory and do some "experimentation," outlined below are steps designed to create that larger workspace that you need.

PC MEMORY MAP

1 TO 640K	Normal DOS Memory
640 TO 704	Reserved (used by some high-resolution graphics cards)
704 TO 768	Video memory and normal graphics memory
768 TO 816	Disk controller buffers and ROM routines
816 TO 960	Reserved for additional ROM (generally free space)
960 TO 1024	ROM bios and basic.

1. The first requirement is to add memory to bring the machine up to 704K. This additional 64K can be used by APL as workspace. (If you have an EGA installed in its default memory location, or a Tecmar card positioned to use this memory, you will have problems getting to 704K.) Use APL M=704 to start APL and the additional memory will be available as workspace.
2. The second way to enlarge the workspace is to remove items from the 0-704K memory region that aren't needed for the workspace. Scrolling buffer (S=) and graphics buffer (R=) functions can take up a considerable amount of space in the primary memory. A typical APL session might require 10K for scrolling buffers and 90K for graphics buffers (90K is needed for high-resolution Epson graphics output). If both of these can be removed from the workspace region and placed elsewhere, you could end up adding 100K or more to the workspace.

   The best location for these buffers is in the 816 to 960K region. This is where expanded memory cards place their memory window, so some of you may already have memory here. Release 6.0 start-up parameters O= and G= allow you to specify the memory locations for offscreen scrolling and graphics buffers. This scheme is most useful for users who need a place to put the R=128 for HP Laser Jet+ graphics printing and who typically run with S=63 (for a total of 192K additional workspace).
3. The third memory expansion scheme is the most useful, but also the most costly and least likely to succeed. Some hardware manufacturers make boards that remap 960-1024K memory to some region outside the 1 megabyte space that the 8086 chip knows about. Then they modify DOS (and the internal request system) so that any request for a bios routine automatically folds in the 960-1024K memory segment and folds out the data that was there.

   The same is true of the 768-816K segment used by the disk controllers. When the routines are finished, they are paged out and the program data is replaced. Then, by moving video memory up to the very top of the memory map (1020-1024K) with the V=startup option, all memory below can be used for APL and workspace. The result should be close to an 800K workspace.

All three of these procedures squeeze as much workspace as possible from a limited memory-bound PC design. These are not solutions to the problem, but they may provide you with some workspace size relief. A "true" solution probably won't be available until the next generation of PCs begin using the Intel 80286 and 80386 processors and protected mode DOS.

Those who need more than half a megabyte of workspace may consider looking at UNIX machines. Generally, they all have workspaces of several megabytes or more. The newest addition to STSC's product line, the APL★PLUS System for the Macintosh, also supports larger workspaces.

PLUS★WARE PRODUCT TRAINING SCHEDULES

APL Training

Rockville	New York City
December 8-11 Introductory APL	December 1-4 Introductory APL
	December 8 Pocket APL in One Day
January 12-16, 1987 Introductory APL	January 26-30, 1987 Introductory APL
January 20 Pocket APL	January 23 Pocket APL
February 9-13 Macintosh APL	February 23-27 Intermediate APL
February 17 Pocket APL	February 19 Pocket APL
Class Location	**Class Location**
2115 E. Jefferson St. Rockville, MD 20852 800-638-6660 In Maryland— 301-984-5000	122 East 42nd St. Suite 1700 New York, NY 10168 212-984-0730

Fee for the four-day APL classes is $800 which includes training, all curriculum materials, lunch, and refreshments.

Fee for the Pocket APL course is $195, which includes all the above plus a copy of Pocket APL software.

To register or for details on schedule and fees for 1987 classes, call STSC at the numbers listed above.

STATGRAPHICS Training

Statistical Graphics Corporation, the developers of STATGRAPHICS, will continue offering a series of three-day seminars in 1987 covering basic data structures, use of STATGRAPHICS expressions, using and defining function keys, and various other procedures.

Fee for the seminar is $650, with discounts offered for companies sending more than one person.

Tentative dates for the seminars are January, April, July and October. To register and to confirm dates, call Statistical Graphics Corporation at (609) 924-9374.

PLUS★WARE PRODUCT INFORMATION LINES

Orders	**800-592-0050**
Product Information	**301-984-5123**
Technical Support (HELP Line)	**301-984-5489**
Software Submissions	**301-984-5468**

RUN-TIME VERSION FOR RELEASE 6.0 OF THE APL★PLUS SYSTEM FOR THE PC NOW AVAILABLE

A run-time version of Release 6.0 of the APL★PLUS System for the PC is now available for application developers who produce APL - based software for distribution or sale.

The run-time version allows developers to take advantage of the powerful features of the APL★PLUS System for the PC without requiring their end-users to purchase the complete APL★PLUS System for the PC.

The run-time version enables developers to include enough of the APL★PLUS System for the PC to run their applications, but not enough to allow end-users to write or modify their own APL programs.

This provides a very secure environment for running applications. If the APL application terminates because of an error or because it is finished, the user is automatically returned to DOS.

For added security, the run-time workspaces can be locked. Only the developer's serialized run-time system is able to access locked workspaces. A user with an APL★PLUS System for the PC or another developer's run-time application cannot load, copy, or run them.

Programs and workspaces currently developed and used with the APL★PLUS System for the PC are easily incorporated into a run-time application. Installation instructions and utilities are supplied with the run-time software.

To increase the developer's flexibility in using the APL★PLUS System for the PC as the underlying application environment, several variants of the run-time system are available: small, medium, large, and full. These variants were produced by removing features or operating characteristics of the regular APL★PLUS System for the PC in order to increase the available workspace size. A developer normally uses the smallest variant that contains all the features needed by the application.

The APL★PLUS Run-Time System for the PC is licensed on a royalty basis. For more information, contact your PLUS★WARE dealer or your STSC sales representative.

Compiled APL?

Yes, indeed. If you are running VS APL or the APL★PLUS Mainframe System on an IBM-compatible mainframe under VM/CMS or MVS/TSO, compiled APL can be yours. The APL★PLUS Compiler rewrites APL programs into machine code, eliminating interpretive overhead and resulting in faster execution. The design of the Compiler allows you to use regular interpreted APL for program development, with programs then being compiled when they are ready for production use. That way, you get the best of both worlds—the flexibility and power of interpreted APL, and the speed of compiled languages.

Write or call today to find out more about the APL★PLUS Compiler.

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